Boston University

Department of Philosophy
745 Commonwealth Avenue
Boston, Massachusetts 02215

Aug. 10, 1990

Dr. Robert Clifton
Peterhouse
Cambridge University
Cambridge CB2 1RD

Dear Robert (and Michael and Jeremy),

Thank you for the thoughtful letter, outlining the proposed changes of your paper. It seems to me that we are now in complete agreement on matters of physics, philosophy, and mathematics, though perhaps not on the ideal mode of exposition.

If you should submit your revised paper in essentially the same format, but with the changes you have proposed, I believe that I would recommend its publication, though I might still have some small suggestions for further changes. On the central point that you raise on p. 6 ("In light of the above, we feel it is unreasonable to expect us to change our paper so that it credits GHZ (or GHZ/Shimony) with obtaining the first measure-theoretically valid proof which uses five sets of angles, as our proof does") I agree substantially, but with a different viewpoint. You were the first to bring attention to bear upon measure-theoretical questions, as GHZ/S credit you. My main point in my referee report is that the essence of the GHZ theorem did not involve an infinite set of quadruples or triples of angles, and therefore no subtle measure theory is required. It simply is not a situation in which the typical rough reasoning of physicists gets into trouble because of neglect of subtleties. But with this difference of point of view Igladly concede your priority on precise use of measure theory.

Even though I would accept your paper with the proposed revisions, I do not think that you are doing the best service to your readers or to yourselves to submit it in the form you propose. My suggestion is that you write a much shorter paper, which essentially does two things: (1) It explores the interesting measure theoretical questions that arise when the premisses make assertions with probability unity (hence for all hidden states except for a set of measure zero). The GHZ argument gives you an opportunity to make such an exploration, and you might try to add to what you have written a discussion of some situation in which a serious conceptual error would result from set theoretical carelessness. (2) It explores the physical content of premisses which are strong enough concerning locality to permit the desired result to be derived. Michael does some of this in his book. Clauser, Horne, and I did some of it in our debate with Bell, first in Epist. Letters, then reprinted in Dialectica about 1987. Such an exploration, pointing out what is plausible physically, should probably not take the form of a series of axioms. We have a situation in which the trappings of formality and rigor may be inappropriate to the actual complex and rather fluid physical considerations. A paper consisting of these two sets of explorations would be much more readable than the one you submitted originally (which took me two whole days to read carefully, even though I know something about Bell's theorem and about measure theory) and probably more readable than the one your porpose to submit, and I think it would have the essential content of the one you propose to submit. As Mies van der Rohe said, "Less is more." I don't think it would take much more time to write the paper in the form I am suggesting than in the form you are suggesting.

There is one matter of chronology that you should know about. I was not the assigned refereee. But the assigned refereee delayed over your paper for about a month until asking me to take his place. After I accepted the job, I completed it

within a week. I know that time is an important consideration for you, because you wish to have the paper included in the Bell Festschrift.

I believe than Zeilinger attended the meeting in Finland, and therefore you may have had a chance to discuss matters with him there, including showing him my letter to you and your reply.

Thank you once again for your unaggressive, thoughtful, intelligent reply to my referee report. I don't like confrontational exchanges, and I am grateful that you have spared me.

With best wishes,

Abner

Abner Shimony

P.S. GHSZ will appear in Am. J. Phys., probably this year, but I'm not sure when.